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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/764,799

01/19/2001

Takashi Watanabe

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12/14/2004

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EXAMINER

LONG, HEATHER R

ART UNIT

PAPER NUMBER

2615

DATE MAILED: 12/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/764,799

Applicant(s)

WATANABE, TAKASHI

Examiner

Heather R Long

Art Unit

2615

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 January 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-13, 15 and 16 is/are rejected.
- 7) ☒ Claim(s) 6 and 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 January 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/19/01 & 5/14/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. Figures 7-9 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. Claims 1-5, 7, 9-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art in view of Lambeth (U.S. Patent 4,512,106).

Regarding claim 1, Applicant's admitted prior art discloses a solid imaging device comprising at least one pixel, the pixel including a photoelectric conversion section (1) and a charge detection node (FD) which are coupled to or decoupled from each other via a transfer gate transistor (2), the charge detection node (FD) being coupled to or decoupled from a drain of a reset gate transistor (3) via the reset gate transistor (3) (Fig. 7), wherein, after the reset gate (3) resets a potential of the charge detection node (FD), the transfer gate transistor (2) is turned ON so as to allow a signal charge to be transferred from the photoelectric conversion section (1) to the charge detection node (FD). However, the prior art fails to teach that the potential of the drain is changed from a HIGH state to a LOW state to a HIGH state while both of the transfer gate transistor and the reset gate transistor are maintained in an ON state (Fig. 8).

Referring to the Lambeth reference, Lambeth teaches that during the initialization of the photosensor a bias voltage (V_D) is applied to the photosensor by changing the potential on the drain and changing all gates between the drain and the photosensor to the ON state to allow the charges to go from the drain to the photosensor in order to improve the signal-to-noise ratio of the sensor (col. 9, lines 3-21). Lambeth also discloses that the potential of the drain is changed

from a HIGH state to LOW state to a HIGH state during the biasing (col. 9, lines 10-19).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to develop the solid imaging device as disclosed by the prior art by improving the signal-to-noise ratio of the imaging device by biasing the photoelectric conversion section by changing the potential on the drain as disclosed by Lambeth and changing the state of the reset gate transistor and the transfer gate transistor to the ON state to allow charge transfer. Since both transistors need to be in the ON state for charge transfer one can see from Fig. 8 of the prior art that this would take place during t_6 when both transistors are on.

Regarding claim 2, the prior art in view of Lambeth discloses all the subject matter as with respect to claim 1, as well as a solid imaging device, further comprising an amplification transistor (4) for amplifying a variation in the potential of the charge detection node (FD) and a pixel selection transistor (5) for selectively reading an output signal from the amplification transistor (4) (Fig. 7 of the prior art), wherein the potential of the drain is varied after an amplified signal of the signal charge is read via the amplification transistor (4) and the pixel selection transistor (5), thereby presetting a potential of the photoelectric conversion section to a constant potential after the read operation (as discussed with claim 1, the potential of the drain would be varied during t_6 of Fig. 8 in the

prior art, which would be after an amplified signal of the signal charge is read via the amplification transistor and the pixel selection transistor).

Regarding claim **3**, the prior art in view of Lambeth discloses all the subject matter as with respect to claim 1, as well as a solid imaging device wherein the transfer gate transistor (2), the reset gate transistor (3), the amplification transistor (4), and the pixel selection transistor (5) are formed of MOS transistor of a same polarity type (prior art).

Regarding claim **4**, the prior art in view of Lambeth discloses all the subject matter as with respect to claim 1, as well as a solid imaging device wherein the transfer gate transistor (2) and the reset gate transistor (3) are embedded channel-type MOS transistors (prior art).

Regarding claim **5**, the prior art in view of Lambeth discloses all the subject matter as with respect to claim 1, as well as a solid imaging device wherein a HIGH level of a pulse voltage for driving the transfer gate transistor (2) is lower than the HIGH level of a pulse voltage for driving the reset gate transistor (3) (Fig. 9 of the prior art).

Regarding claim **7**, the prior art in view of Lambeth discloses all the subject matter as with respect to claim 1, as well as a solid imaging device wherein a plurality of the pixels are arranged in a matrix, wherein the drains of the reset gate transistors in each row of the matrix are interconnected, independently from row-to-row, so as to be connected to a scanning circuit, and

wherein the scanning circuit sequentially applies pulse signals voltages to the drains on a row-by-row basis (Figs. 7 and 8 of the prior art).

Regarding claims **9-13** and **15**, these are method claims corresponding to the apparatus claims 1-5 and 7. Therefore, claims 9-13 and 15 are analyzed and rejected as previously discussed with respect to claims 1-5 and 7.

5. Claim 8 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's admitted prior art in view of Lambeth as applied to claim 1 above, and further in view of Fossum et al. (U.S. Patent Application Publication 2003/0193597).

Regarding claim **8**, the prior art in view of Lambeth discloses all the subject matter as with respect to claim 1, except that the solid imaging device further comprises a correlated double sampling circuit for calculating a difference between a signal charge immediately after the potential of the charge detection node is reset and a signal charge immediately after the signal charge is transferred from the photoelectric conversion section to the charge detection node, and outputting the calculated difference as a net signal component representing a net signal charge.

Referring to the Fossum et al. reference, Fossum et al. discloses a solid imaging device further comprises a correlated double sampling circuit for calculating a difference between a signal charge immediately after the potential of the charge detection node is reset and a signal charge immediately after the signal charge is transferred from the photoelectric conversion section to the

charge detection node, and outputting the calculated difference as a net signal component representing a net signal charge (paragraphs [0028] and [0029]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the solid imaging device as disclosed by the prior art in view of Lambeth by including a correlated double sampling circuit for calculating a difference between a signal charge immediately after the potential of the charge detection node is reset and a signal charge immediately after the signal charge is transferred from the photoelectric conversion section to the charge detection node, and outputting the calculated difference as a net signal component representing a net signal charge as disclosed by Fossum et al. in order to determine the number of photoelectrons that were allowed to enter the floating diffusion region along with reducing noise.

Regarding claim **16**, this is a method claim corresponding to the apparatus claim 8. Therefore, claim 16 is analyzed and rejected as previously discussed with respect to claim 8.

Allowable Subject Matter

6. Claims 6 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
7. The following is a statement of reasons for the indication of allowable subject matter: prior art fails to teach or fairly suggest a solid imaging device, in combination

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with all the other elements claimed, wherein a period t_1 during which the signal charge is transferred from the photoelectric conversion section to the charge detection node and a period t_2 after the potential of the drain is changed from the LOW state to the HIGH state until the transfer gate transistor is turned OFF satisfy the relationship $t_1 = t_2$.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather R Long whose telephone number is 703-305-0681. The examiner can normally be reached on Mon. - Thurs.: 7:00 am - 4:30 pm, and every other Fri.: 7:00 am - 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Christensen can be reached on (703) 308-9644. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Heather R Long

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Examiner
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HRL
December 8, 2004

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke extending to the right.

ANDREW CHRISTENSEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600